

Device comprising two hollow profiles which are held together by a connecting screw, and corresponding tool

The invention relates to a device comprising two hollow profiles arranged in a butt-jointed manner approximately at right angles to one another, each of which has a profile channel parallel to its profile longitudinal axis and also, in at least one profile side surface, an undercut longitudinal groove parallel to the profile channel, according to the preamble of the independent claim. The invention furthermore relates to a tool for operating the connecting bolt.

Document DE 201 06 561 discloses a device for connecting a first profile bar to a second profile bar which bears with a front face against a longitudinal side of the first profile bar. These profile bars are provided with undercut longitudinal grooves along their longitudinal sides and contain a clamping screw with a screw head and a threaded shaft which can be fixed in the region of the screw head in the undercut longitudinal groove of the first profile bar and can be screwed with its threaded shaft into a longitudinal bore formed in the second profile bar. Said screw head has, on a disc-shaped collar, a tothing which can be brought into active connection with a turning tool. The turning tool is a bar with a tothing integrally formed in an axis-parallel manner at one of its ends, which tothing can be brought into contact with the tothing on the collar.

Another device is described in EP 0 136 431 A2. Two hollow profiles of square cross section with a central profile channel and a longitudinal groove running centrally in each profile side surface are connected by means of a commercially available screw. The latter passes through an elongate insertion plate which is arranged in the undercut groove space of the longitudinal groove, said plate having legs which protrude in a U-

shaped manner and which pass through the longitudinal groove for holding purposes and to prevent twisting. In order to be able to operate the screw, there must be in the bottom of the groove a number of openings which penetrate the hollow profile; the screwdriver which is to be inserted into a slot in the screw head is introduced through one of these openings.

The hollow profiles, which are usually extruded from an aluminium alloy, must therefore be reworked in a special way after they have been manufactured; the making of the radial openings is very complicated and considerably reduces the stability of the profile.

Knowing this prior art, the inventor set himself the aim of improving the system outlined above and avoiding additional processing of the holding profiles that are used. The longitudinal grooves are to remain open so that it is possible where necessary to introduce flat elements.

This aim is achieved by the teaching of the independent claim; the dependent claims provide advantageous further developments. Moreover, all combinations of at least two of the features disclosed in the description, the drawing and/or the claims also fall within the scope of the invention. When dimension ranges are specified, values lying within the stated limits are also intended to be disclosed as limit values and can be used at will.

According to the invention, the screw head of the connecting screw tapers provided on its periphery - which is circular in cross section - with grooves or notches which run in planes extending from the shaft longitudinal axis - and defined by the latter in terms of their course - and form ribs between them. It has proven to be advantageous that the screw head tapers conically towards a head surface remote from the shaft, and this wall

surface which is inclined at an angle with respect to the shaft longitudinal axis contains said grooves or notches. This angle should preferably be approximately 45°.

According to a further feature of the invention, the screw head should have, between a shaft-facing connection surface and the inclined wall surface, an annular section of constant diameter in which the shaft-facing ends of the grooves or notches form a crenellated edge pattern. The inclined wall surface should end at the head surface of the screw head or - in another embodiment - at a radial step surface, which latter surrounds in an annular manner an integrally formed top body. This tooth-free or notch-free end section is supported on the groove bottom when screwed on, and ensures a mating hold.

The shaft of the connecting screw (also referred to as a connecting bolt) which adjoins this screw head is

conically tapering wall section 42 and thus also each of the notches 43 merge into an annular, radially oriented step surface 46 which surrounds an integrally formed top body 48 having a height  $n_3$ . The smooth peripheral surface thereof is inclined towards the axis in cross section in a manner corresponding to the associated wall section 42 within the screw head 36. The top body 48 ends at a head surface 50 which adjoins the screw head 36, wherein a hexagonal socket 49 can be seen in said head surface.

In order to produce the desired connection of the two hollow profiles 10, 10<sub>a</sub>, the screw head 36 of the connecting bolt or connecting screw 30 is pushed into one of the groove spaces 26 of the lower hollow profile 10<sub>a</sub> in Figs. 2, 3; in the process, the screw shaft 32 slides in the longitudinal groove 22 of the hollow profile 10<sub>a</sub> in an axis-parallel direction. At a predefined point, the front face 18 of the other hollow profile 10 is brought towards the profile longitudinal axis A of the first hollow profile 10<sub>a</sub> at right angles, and the profile channel 14 of

said second hollow profile 10 is axially assigned to the screw shaft 32.

Rotation of the screw shaft 32 into the profile channel 14 or the profile body 12 of the other hollow profile 10 which surrounds the latter is carried out by means of a tool 52 which is partially shown schematically in Fig. 2. This tool consists of a round profile 54 having a diameter  $q$  of in this case 8 mm, preferably a steel rod, said round profile optionally being bent at an angle in the longitudinal direction. Said diameter  $q$  should be shorter than the height or depth  $e$  of the groove space 26 of the hollow profile 10, 10<sub>a</sub>. This round profile 54 is designed to a length  $t$  of approximately 10 mm at one end as an insertion head 56 with a peripheral surface 57 which tapers conically at an angle  $\gamma$  of approximately 25°, said peripheral surface being provided with parallel longitudinal notches 58 for receiving ribs 44 of the screw head 36. A correspondingly inclined protective section 66 of a protective plate which is essentially designed as an angled piece bears against the peripheral or outer surface of said insertion head 56; said protective plate is placed onto the round profile 54 by means of a radial section 62, with a lateral section 64 of the protective plate 60 running parallel to the longitudinal axis  $Q$  of said round profile at a distance therefrom. This lateral section is angled towards the insertion head 56 close to the latter at a bend point 65, forming said protective section 66.

As shown in Fig. 3, the insertion head 56 of this tool 52 is pushed in between the screw head 36 of the installed connecting screw 30 and the groove bottom 27 (covered by the protective plate 60) of the corresponding longitudinal groove 22, with which the insertion head axis  $Q$  delimits an angle  $w_1$ . By rotating the insertion head 56 about its longitudinal axis  $Q$ , with the insertion head rolling on the protective section 66 of the

protective plate 60, the toothed screw head 36 of the connecting screw 30 is operated and thus the screw shaft 32 is screwed in.

A different embodiment of the connecting bolt 30<sub>a</sub> is shown in Figs. 4, 5. The screw head 36<sub>a</sub> thereof has a relatively high annular section 40 which is adjoined by a conical wall section 42 of approximately the same height  $n_2$ . The latter ends at a free head surface 50<sub>a</sub>; the above-described top body is omitted here.

Assigned to the connecting bolt 30<sub>a</sub> is a slip-on collar 70 of rectangular outline having a height  $i_1$  and a width  $g_1$  on a base strip 71 - having a height  $i_2$ , a length  $c$  and a width  $b_1$  - and an integrally formed collar piece 72 having